



## PENETRATION FLANGE WITH CONNECTORIZED INTERNAL FLANGE (M12 x 9)

### Installation Manual





## Safety Information

The following manual contains information and warnings that must be observed and followed in order to keep instruments in good condition and insure safe operation.

## Safety and Electrical Symbols

	<b>Warning - Danger</b> - Identifies conditions or practices that could cause physical harm or severely damage the equipment.
	<b>Caution</b> - Identifies conditions or practices that could affect product performance.
	<b>Important Information</b> - Must be read and followed.

## Safety Precautions

<b>Warning - Danger</b> <b>Caution</b>
<ul style="list-style-type: none"> <li>• Due to the flange's weight, special care must be taken when welding it to the stator housing;</li> <li>• Caution must be taken during the welding process to ensure safety and retain complete integrity during the pressure (leak) test;</li> <li>• The installation must be done by qualified personnel that meet regional standards and safety regulations;</li> <li>• The flange is usually installed in hydrogen-cooled environments, take special precautions when working in such hazardous conditions.</li> </ul>

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 Loctite® is a registered trademark of Henkel Corporation  
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## 1. GENERAL DESCRIPTION

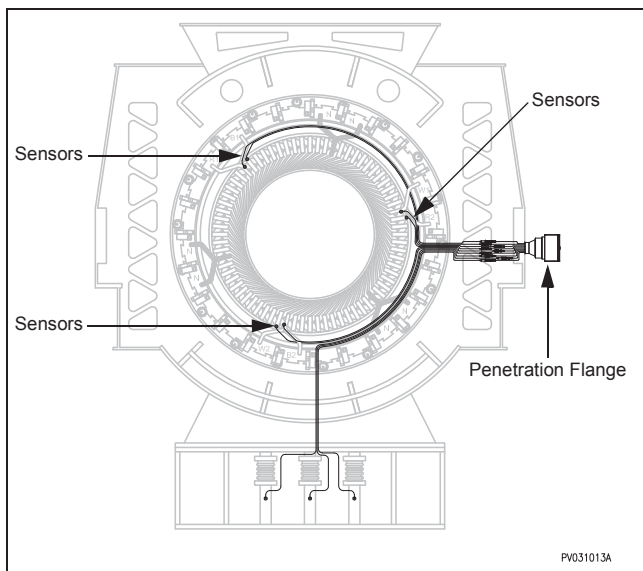
Hydrogen-cooled turbo generators require specialized flanges to allow internal sensors to interface with outside instrumentation systems without creating hydrogen leaks and loss of pressure. The flange is composed of two main sections: the penetration flange and the connectorized internal flange (M12 x 9). The penetration flange is welded onto the stator housing to which a hole is bored, while the connectorized internal flange (M12 x 9) is installed within the penetration flange allowing extension cables to safely exit the generator.

## 2. MAIN INTERVENTIONS

- Flange(s) must be installed directly on the exterior of the stator housing, near both ends of the generator;
- Hole(s) must be bored through the stator housing (not done by VibroSystM);
- Welding must be exercised outside the generator (not done by VibroSystM);
- A pressure (leak) test is required (not done by VibroSystM).

## 3. PENETRATION FLANGE INSTALLATION

### 3.1 Determining an Exit Point



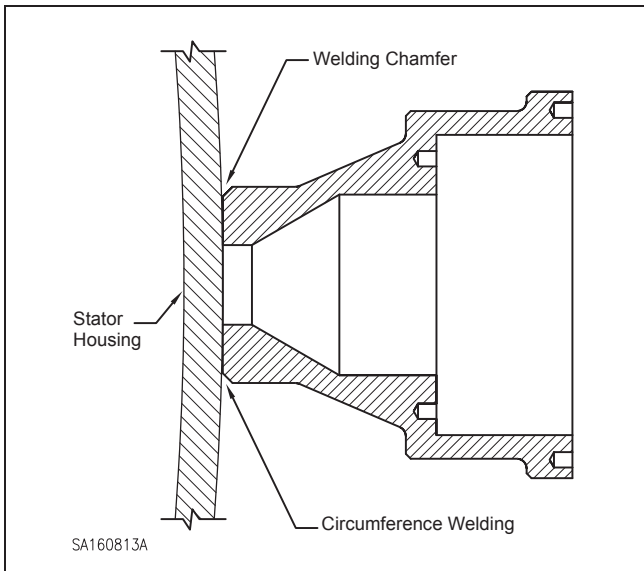
1. Make sure to carefully map out the exit point on the stator housing in relation to maximum internal cable length. The illustration on the left shows a typical flange installation inside a turbo generator. Use it as a reference for mapping out the ideal exit point.



### 3.2 Welding the Penetration Flange

#### ! Important Information

- Before welding, read the “PENETRATION FLANGE WELDING RECOMMENDATIONS DOCUMENT” at the end of this manual.

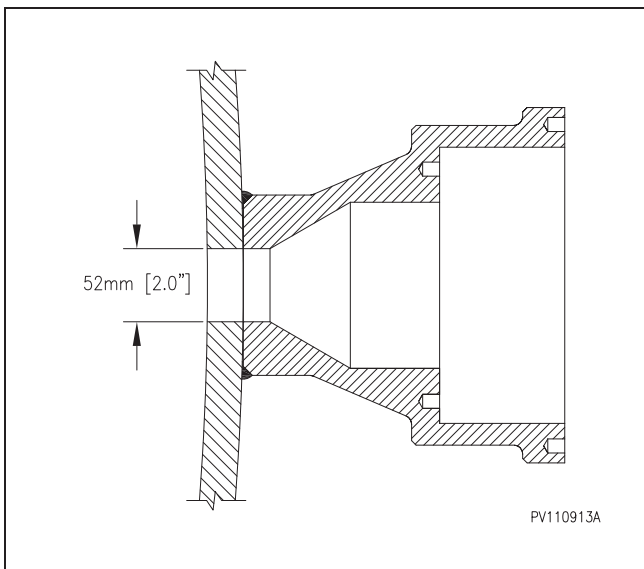


1. Once the exit point has been determined, prepare the surface for welding;

#### ! Caution

- Make sure the penetration flange is well supported and stable before welding.
2. Position the flange in place and proceed with the welding;
  3. A pressure (leak) test is necessary to verify the weld's effectiveness.

### 3.3 Boring the Stator Housing



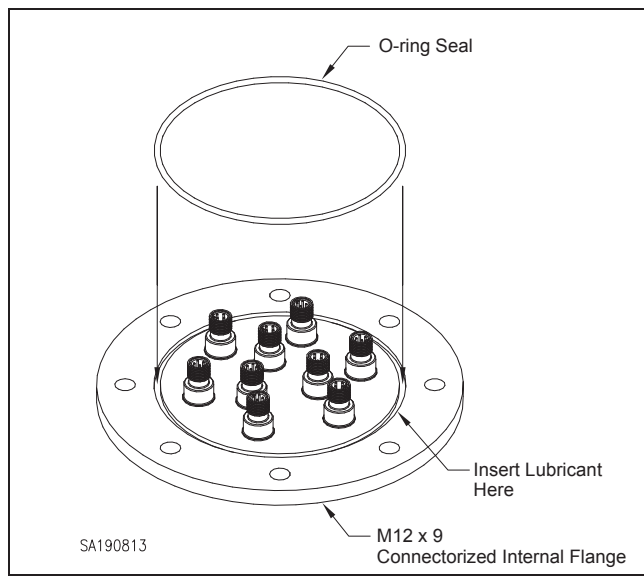
1. Bore a hole in the stator housing, at the center of the welded penetration flange.



## 4. CONNECTORIZED INTERNAL FLANGE INSTALLATION (M12 x 9)

The connectorized internal flange is built with 9 M12 feedthrough connectors that interface between the sensors and outside measuring instrumentation. A Viton® O-ring seal is installed inside the flange to properly seal it against hydrogen leaks.

### 4.1 O-ring Seal Installation

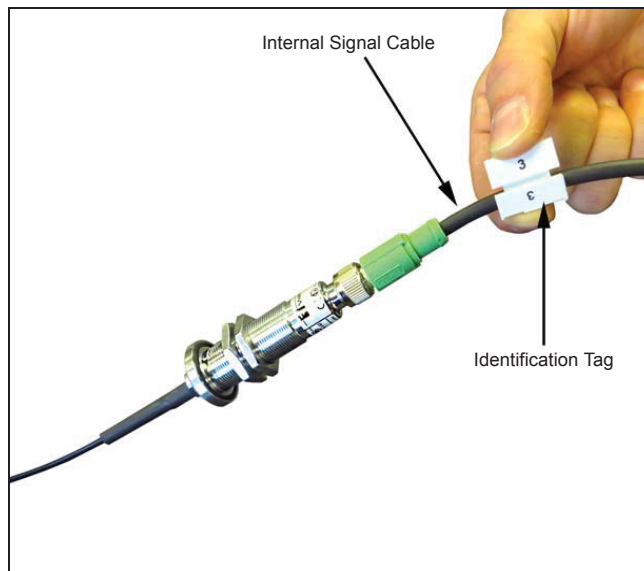


#### **Caution**

- O-ring seal installation is critical for sealing the connectorized internal flange.

1. Apply a small quantity of Parker-O-Lube® Lubricant inside the flange's groove;
2. Carefully inspect the provided O-ring seal to make sure it is not damaged;
3. Carefully place the O-ring seal inside the groove.

### 4.2 Cable Identification



1. In order to prevent sensor mismatch, use the provided identification tags to mark each internal signal cable with the same reference number on both ends. This will be useful when connecting the M12 female connectors to the connectorized internal flange (M12 x 9).



### 4.3 Final Flange Assembly

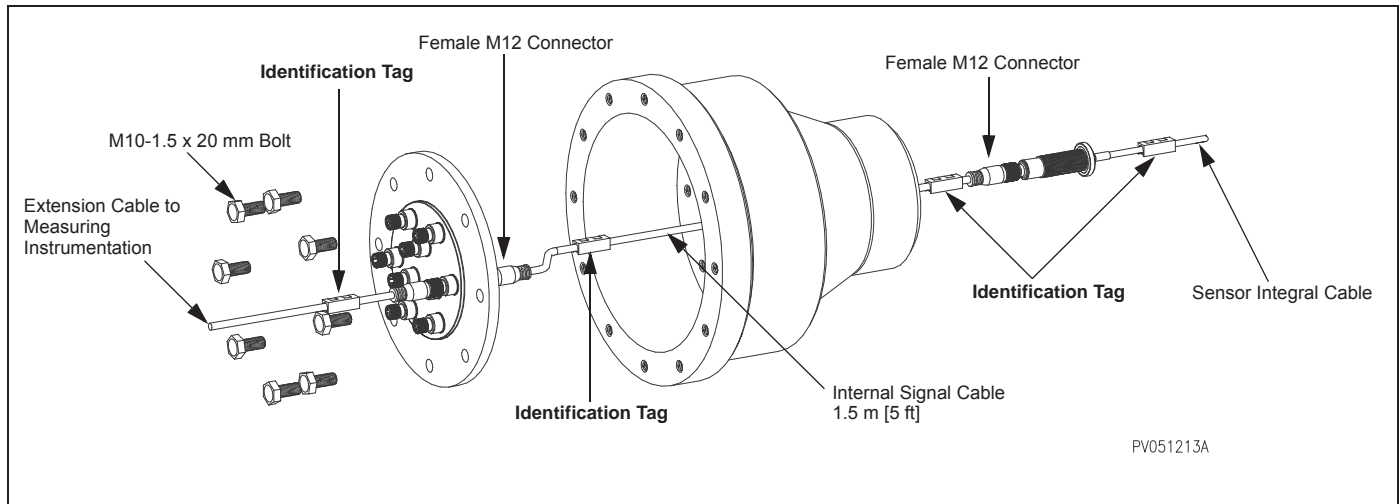
1. Connect all internal signal cables to the M12 connectors on the O-ring side of the connectorized internal flange. Cable reference numbers must match the connector numbers located on the flange;
2. Once all connectors are properly installed and secure, carefully place the connectorized internal flange (M12 x 9) inside the penetration flange;

#### Important Information

- To insure proper installation, apply Loctite<sup>®</sup> Threadlocker Blue 242 on the M10 x 1.5 bolt threads.

3. Tighten the M10-1.5 x 20 mm bolts in a crisscross sequence to 61 Nm [45 ft-lb];
4. Connect the sensor integral cables to the internal signal cables. Use the provided identification tags to mark the integral cables;
5. Connect the extension cables to the M12 connectors on the connectorized internal flange's exterior side. Use the provided identification tags to mark the extension cables.

### Typical Flange Assembly



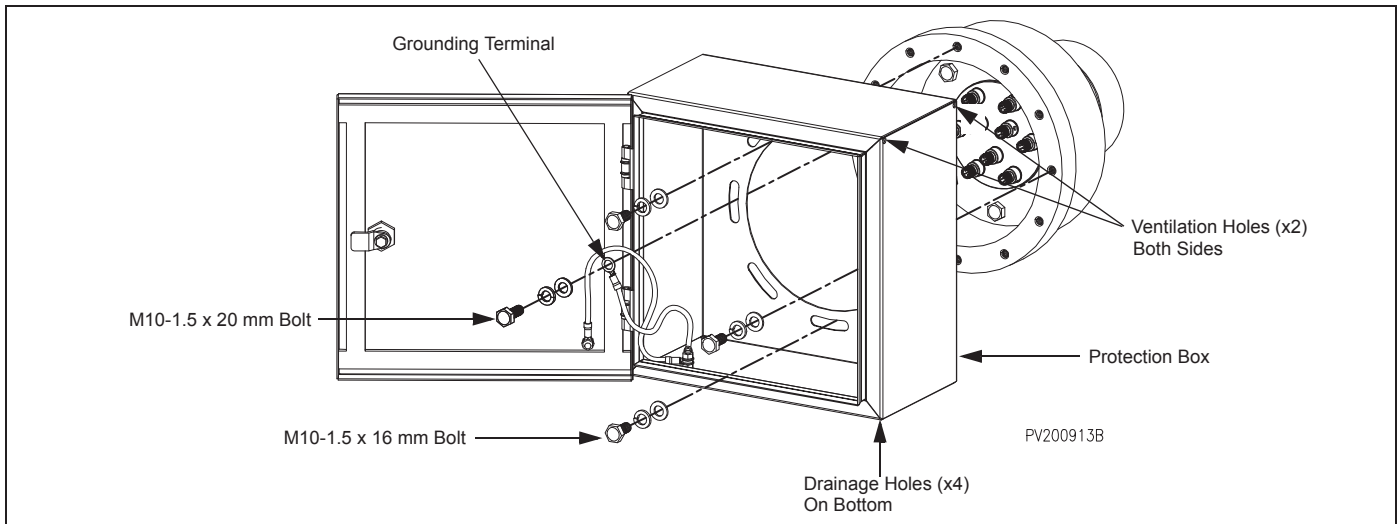




## 5. PROTECTION BOX INSTALLATION

### Caution

- The protection box is designed with built-in holes at its extremities to avoid hydrogen or water build-up. The box must be properly placed in order to make these holes effective.
1. Carefully align the protection box over the penetration flange and make sure it is installed horizontally with the hinges on the left hand side;
  2. Use any slotted hole combination to position and secure the box;
  3. Torque the three M10-1.5 x 16 mm bolts to 61 Nm [45 ft-lb];
  4. Secure the grounding terminal with the M10-1.5 x 20 mm bolt. Torque to 61 Nm [45 ft-lb].



### Important Information

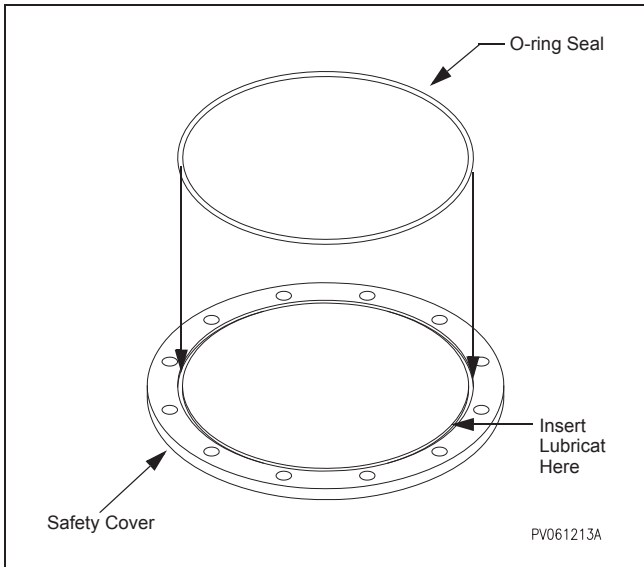
- To avoid unnecessary stress on the M12 female connectors, VibroSystM recommends using strain relief fittings to secure the extension cables.



## 6. SAFETY COVER INSTALLATION

A safety cover is provided in the event of hydrogen leaks coming from inside the penetration flange. The cover will stop all leaks, but will condemn the entire flange assembly.

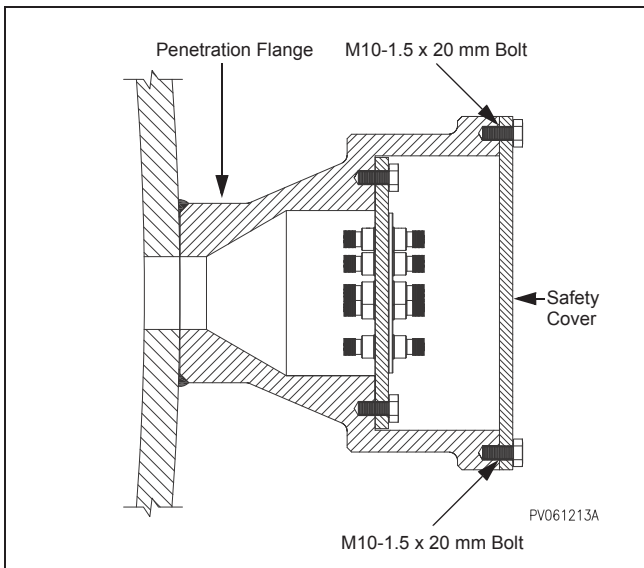
1. Remove all extension cables from the M12 connectors located on the outside of the connectorized internal flange (M12 x 9);
2. Remove the protection box;



### Caution

- O-ring seal installation is critical for sealing the safety cover.

3. Apply a small quantity of Parker-O-Lube<sup>®</sup> Lubricant inside the safety cover's groove;
4. Carefully inspect the provided O-ring seal to make sure it is not damaged;
5. Carefully place the O-ring seal inside the groove;



6. Install the safety cover onto the penetration flange. Torque the M10-1.5 x 20 mm bolts to 61 Nm [45 ft-lb].



## 7. GENERAL SPECIFICATIONS

### 7.1 Connectorized Internal Flange (M12x9)

#### Connection

- Type: Male to Male M12, 5-Pin Feedthrough Connector
- Number of Connectors: 9
- Maximum Voltage: 30 V
- Maximum Current: 200 mA

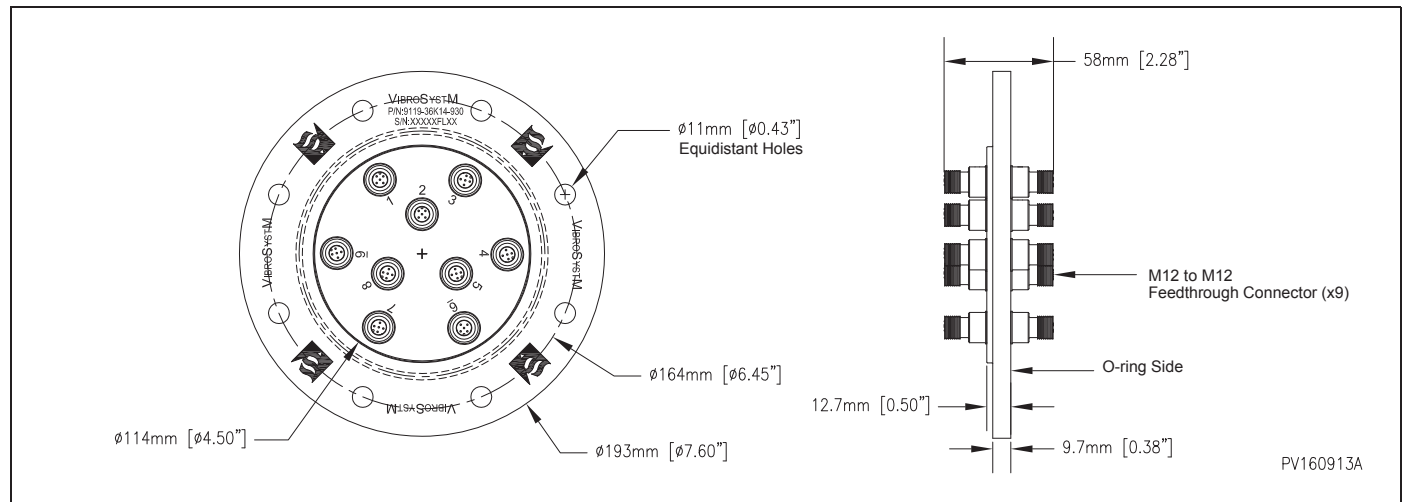
#### Environment

- Galvanic Corrosion Protection: Non-Conductive Film Installed on O-ring Side
- Temperature Range
  - Operating: 0 to 70°C [32 to 158°F]
  - Storage: -20 to 85°C [-4 to 185°F]
- Operating Pressure: Tested up to 1379 kPa [200 psi] Helium

#### Physical Characteristics

- Material: 6061-T6 Aluminum
- Finish: Matt Black Film (O-Ring Side)
- Sealing: Viton® O-ring AS-568A  
Dash No: -250
- Weight: 1.2 kg [2.5 lb]
- Protection Rating: IP54
- Mounting: Using Penetration Flange

#### Dimensions





## 7.2 Penetration Flange with Safety Cover

### Physical Characteristics

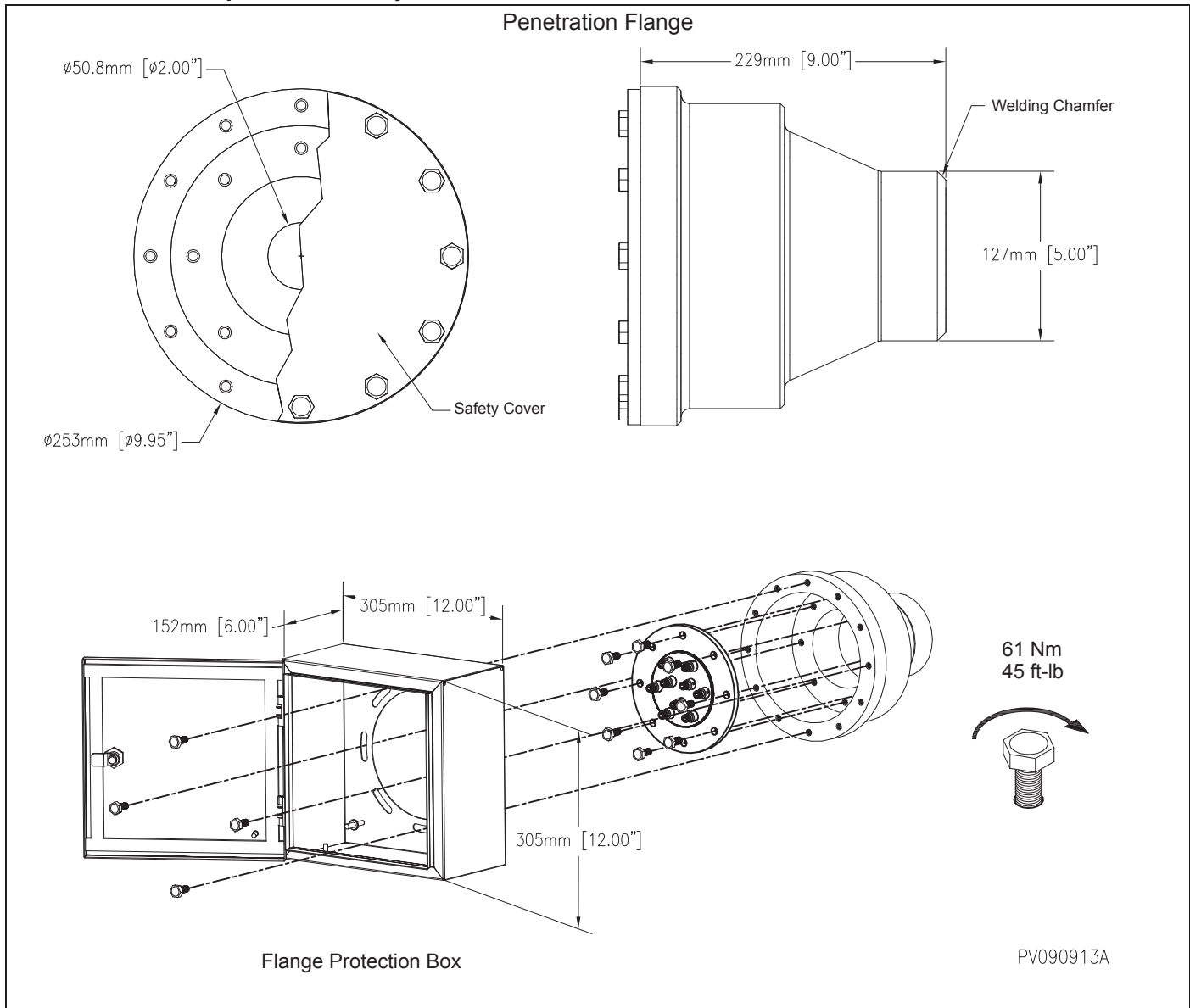
- Material: AISI 1045 Steel
- Finish: Nickel-Plated
  - Plating Thickness: Max: 15 µm [0.6 mil]
- Weight: 29.4 kg [65 lb]
- Safety Cover Seal: Viton O-ring (Included)  
AS-568A Dash No: -266
- Mounting: Welding

## 7.3 Flange Protection Box

### Physical Characteristics

- Material: 14 Gauge Steel
- Finish: Painted, ASA 61 Grey
- Protection Rating: IP21
- Ventilation Holes: 4 on Top, ø6mm [0.25 in]
- Drain Holes: 4 on Bottom, ø6mm [0.25 in]
- Mounting: Slotted Levelling Holes

## Dimensions - Complete Assembly





## 8. PENETRATION FLANGE WELDING RECOMMENDATIONS DOCUMENT

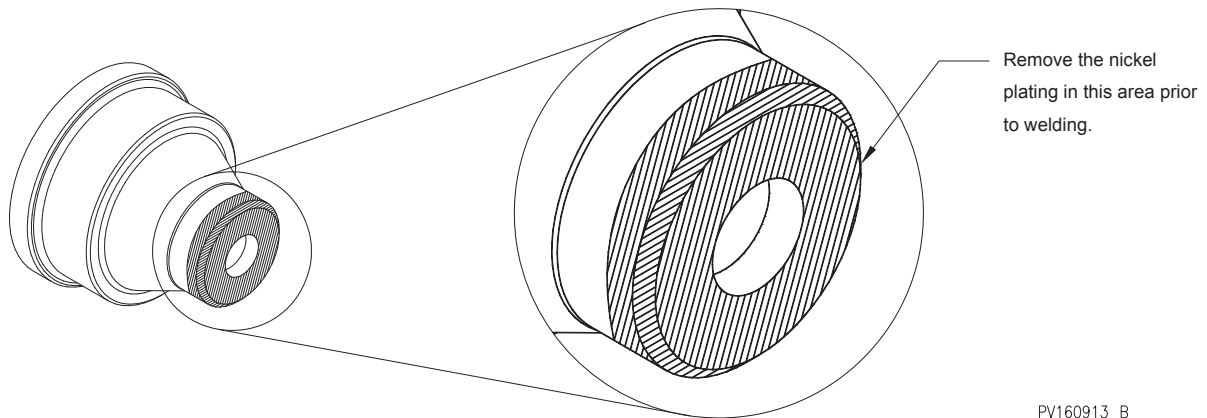
### General Information

#### Material

The penetration flange is made up of AISI 1045 medium carbon steel in order to achieve a proper surface finish for the O-ring seal's efficiency. This also reinforces the quality and durability of the flange's internal threads.

#### Finish

A nickel-plating finish provides protection against any forms of corrosion and must be removed (grinded) in some areas before welding (see illustration below).



### Welding Recommendations

When dealing with thick material sections, such as the penetration flange, the steps taken to obtain a hydrogen leak-free weld seam should be the same for low and medium carbon steel. The following steps should be observed:

- Surfaces to be welded should be clean, grinded to the bare metal, and free of oil or other deposits;
- Low hydrogen electrodes and appropriate filler wire should be used;
- The heat-affected zone should be preheated;
- The interpass temperature should be controlled;
- A slow cooling rate is recommended (a fire retardant blanket may be used).

This document is not a Welding Procedure Specification. It only points out general practices that should be applied. Flange welding must be done by qualified and trained personnel only.

This document is provided solely for guidance. VibroSystM Inc. takes no responsibility or liability for any damage caused by accidents, improper installation or misuse. Liability is limited to the repair and/or replacement of defective products.

